WATER-LEVEL MOVEMENTS AS AN INDICATOR OF FOREST-FIRE WEATHER[1]

By DAVID G. THOMPSON

The water-level movements in a well as obtained by automatic gage, have been put to a new use in New Jersey. In an attempt to determine what constitutes "good fire weather" and predict the likelihood of forest fires, Mr. A. D. Follweiler of the forestry division of the State department of conservation and development has been making a study of the relation between meteorologic conditions and the number and size of fires each day during the fire seasons, which occur in the spring and fall. Observations are being made of barometric conditions, precipitation, relative humidity, wind velocity and direction, temperature, and sky conditions.

On certain days when other conditions indicated the fire hazard to be great, the number of fires was unexpectedly small and the question arose as to the influence of soil moisture in keeping the underbrush damp. A study of the record of the fluctuation of water level in a shallow well, in which the water level ranges 3½ feet to less than 1 foot below the surface, showed that on these days the water level was high. Recently, when the water level was lower, there were bad fires. The well record is now being furnished regularly to the forestry division.

The nearness of the water level to the surface in the locality of the observation well probably does not in itself exert a direct influence in preventing fires, for even within a few hundred yards, due to surface configuration, the water table lies so far below the surface that there can be no upward capillary movement to keep the surface moist. Rather, it is merely an indication of general moisture conditions. Doubtless it would be more significant to make determinations of the moisture content of samples of the surface foot of soil in localities where the water table is both near the surface and at a considerable depth below it, but it has not been possible to do this.

A comparison is also being made between the streamflow and the number of fires. So far this seems to indicate a relation similar to that existing in the comparison with ground water conditions, presumably because the ground-water and surface-water conditions are so interrelated.

[1] Communicated to the editor by the Director of the U. S. Geological Survey. Mr. Thompson is a geologist in the water resources branch of that survey.—ED.

TORNADOES IN KANSAS, JULY 16, 1927

[Condensed from reports furnished by P. Connor and B. R. Laskowski]

Kansas City and vicinity.—The morning weather map showed a zone of relatively low pressure about 500 miles wide from Lake Superior southwest to the Texas Panhandle, with readings ranging from 29.80 to 29.90 inches. An area of high pressure overspread the Southeast and another was centered over the northern Rocky Mountain region.. The line of demarcation between the surface air drifts from the north and the south, extended directly from a little east of St. Paul and Duluth southwestward a little west of Omaha, Concordia, Dodge City, and Amarillo.

The morning temperatures were ordinary generally, perhaps a little below normal. Rains occurred the night before in the middle Missouri Valley and Minnesota, while clear sky appeared over the Southwest.

Locally, it was a day of uncertain weather, cloudy until 1 p. m. with a thunderstorm in forenoon. Then the clouds began to clear away as if all trouble had passed, only to reassemble again before 4 p. m., leading to the approach of a thunderstorm from the west of rather ominous appearance.

The first thunder was heard at 4:10 p. m. Rain began at 4:17 and ended at 5:27 p. m., the total amount being 0.34 inch. The wind was gentle. There was nothing in the instrumental registration in the Weather Bureau office to indicate that anything of a destructive character had taken place.

The tornado formed about 1 mile west of Monrovia, a small farm and gardening settlement in Johnson County, Kans., at 4:45 p. m.

No one reported having seen a funnel-shaped cloud, but a few persons claimed to have seen a "whirling cloud dip and bounce."

According to many witness the storm had been threatening for some time. Thunder was heard a half-hour before the tornado formed. From Monrovia witnesses saw two great black clouds traveling from opposite directions which "met with a crash of thunder." The air suddenly became oppressive and a copperish haze spread over the scene of "collision." Some heard a moan, others the noise of a train. Most of them, however, were not alarmed by what they heard, taking it for the approach of a thunderstorm.

It was preceded by a rather heavy downpour of rain.

From Monrovia the tornado traveled about 3 miles northeastward, a little to the north of Shawnee and Merriam, Kans., to South Park, a small settlement along the Kansas City-Olathe Highway, about 2 miles southwest of Rosedale, Kans., where it caused its greatest destruction, and apparently where its energy dissipated. Its path was about 4 miles long and about 600 feet wide.

Some persons and newspapers have stated that it reasserted itself a little later in the extreme southern part of Kansas City, Mo., where quite a little damage was done, beginning about Eighty-third and Main Streets, and extending about 1½ miles northeastward, its path being about 500 feet wide.

The writer, although admitting the possibility of this, is unwilling to accept the statement as a fact, for the reason that in order to have done so, it would have had to be transposed at the cloud level nearly 6 miles on a southeast line, from where it disappeared on the Kansas side while moving in a northeast direction. The writer would prefer assuming that it was a result of a secondary concentration of forces, an independent development, which visited the southern section of Kansas City, Mo., as the parent disturbance moved eastward.

Damage first began at Monrovia. From there to the edge of South Park the ground is high, a country district. Two dwellings were totally destroyed and about 18 damaged. Several barns and chicken houses were wrecked; large limbs of trees were torn off here and there and a few trees blown down.

South Park is in a narrow valley. The houses are small, in most cases frail frame structures; a few stucco cottages and there was one 2-story brick building, part stores and part dwelling quarters.

About 20 dwellings were destroyed and about 35 others had the sides torn off, the whole or parts of roofs and porches were carried away and chimneys were blown down. Some large trees were uprooted and large limbs were broken off the trunks of many others. There was

very little evidence of the foliage having been stripped from the trees.

In Kansas City, Mo., the tornado began its work of destruction in the neighborhood of Eightieth to Eighty-third and Main Streets, 3 small houses being demolished and about 10 damaged. In the vicinity of Troost and Tracy Avenues it practically destroyed a frame store and considerably damaged a few houses. Farther along its northeastward course of about 1½ miles, it damaged a house slightly here and there and broke off some limbs of trees to about Sixtieth and the Paseo, where its force became exhausted.

CASUALTIES

In Kansas.—Four killed; 40 injured, several dangerously; 100 rendered destitute. Property damage: 22 dwellings demolished; 53 damaged, some quite badly. Estimated property damage, $150,000, plus $10,000 damage sustained by the Southwest Bell Telephone Co.

In Kansas City, Mo.—No casualties of a personal nature. Property damage: Four small houses wrecked and 16 others more or less damaged. Estimated loss about $25,000.—*P. Connor.*

Wabaunsee and Morris Counties.—A tornado was observed between 4 and 4:30 p. m. 6 miles northeast of Harveyville, in the southeast corner of Wabaunsee County; it moved thence east-southeast over a path 12 miles long and 60 rods wide to the northeast part of Burlington County, where it disappeared. The greatest damage was inflicted in the last 3 miles of its path. A second tornado was observed at 4:15 p. m. a mile northeast of Dunlap in Morris County. This point is about 30 miles southwest of the point of origin of the tornado first described; it also moved in an east-southeast direction over a path about 28 miles long and from a few feet to 50 feet in width. Further details regarding all of these storms is given in table on page 337.—*B. R. Laskowski.*

NOTES AND ABSTRACTS

ON THE MECHANISMS OF CYCLONES AND ANTICYCLONES[1]

By T. KOBAYASI

The author points out that, according to the Bjerknes theory, two air currents from different sources meet in a cyclone and consequently the latter is always accompanied by two lines of discontinuity. In actual cases, however, it is further pointed out, some cyclones lack one or both such lines whence the author considers cyclones as circular vortices and seeks to find the causes from which lines of discontinuity are formed.

His studies lead him to consider as the much more plausible of the theories of the mechanism of a cyclone that one which gives the circulation up to 2 to 4 km. a form resembling that of a vortex in a stream. He has calculated for many cyclones the height at which they acquire this character and finds the level in winter to be between 2 and 3 km. and in summer between 2.5 and 4 km. and these heights he considers as the limits of the atmosphere influenced by the temperature at the earth's surface by means of turbulence and convectional motions. The full account is to be published in Rep. Aeronaut. Research Inst. Tokyo Imp. Univ. Vol. II, No. 20.—*A. J. H.*

RECORDER OF FREQUENCY OF ATMOSPHERICS: ITS USE IN METEOROLOGY[2]

By R. BUREAU, A. VIAUT, and A. GRET

(Abstract reprinted from *Science Abstracts*, May 25, 1927, 1308, pp. 372-373)

In the apparatus used each atmospheric functions a relay, and a current is conveyed through an electromagnet to operate the recording part. A curve is traced whose ordinates are proportional to the frequency of the atmospherics. The curves between August and December, 1926, covered many types of atmospherics and many meteorological situations, but a sharp relationship is shown between the passage of surfaces of discontinuity and the evolution of atmospherics.

In one striking case the atmospherics coincided exactly with the moment at which each of a series of squalls passed over.

It is concluded that (1) the source of a very great number of atmospherics, is in the atmosphere in the immediate vicinity of the wireless-telegraph station, and (2) registrations of atmospherics form one of the most powerful means for the analysis of the detained structure of the meteorological discontinuities, and, in particular, the principal and secondary cold-front discontinuities.—*R. S. R.*

NEW IRRIGATION PROJECTS IN ARIZONA AND NEW MEXICO[1]

Larger and larger areas of desert land are being reclaimed in Arizona by the building of a chain of dams in Salt River and its tributaries for the further conservation and use of water both for power and irrigation. The two separate and distinct uses are made possible by the very simple expedient of constructing a low diversion dam immediately below the power house at the foot of the storage dam so that the water after passing through the turbines is again caught and diverted for irrigation purposes.

The Roosevelt dam—a Federal project—was completed in 1911. Since that time a chain of dams below it have been completed, that known as Horse Mesa, which backs water up to the foot of the first-named being the most recent. Dams downstream from Horse Mesa are Mormon Flat, Stewart Mountain, Granite Reef, and Joint Head diversion.

What is to be known as Lake Pleasant, a body of water 8 miles long and 2 wide, impounding 173,500 acre-feet for the irrigation of 40,000 acres of land, has been created on the Agua Fria River near Phoenix, Ariz.

Another privately financed project is that known as Bluewater-Toltec of Valencia County, N. Mex. This project includes a storage dam at the head of Bluewater Canyon that will impound 53,000 acre-feet and provide irrigation for 10,000 acres of land.

A beginning has been made in the construction of the Coolidge Dam, San Carlos project, Ariz. This dam when completed will store 1,285,000 acre-feet.

[1] In Proceedings Imperial Academy, Japan 3: no. 2, p. 72.
[2] Comptes Rendus, 184: 157-158, January 17, 1927.

[1] Condensed from Modern Irrigation, June, 1927.